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TITLE: Controlled cleavage process and device for patterned films

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INVENTOR-INFORMATION:

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CLAIMS:

What is claimed is:

1. A process for forming a film of material comprising devices, said process comprising steps of:

introducing particles in a selected manner through a surface of a substrate to a selected depth underneath said surface, said particles being at a concentration at said selected depth to define a substrate material to be removed above said selected depth; and

providing energy to a selected region of said substrate to initiate a controlled **cleaving** action at said selected depth in said substrate, whereupon said **cleaving** action is made using a propagating cleave front to free a portion of said material to be removed from said substrate;

wherein said substrate material to be removed comprise a plurality of devices therein.

2. The process of claim 1 wherein said particles are derived from a source

selected from the group consisting of hydrogen gas, helium gas, water vapor, methane, hydrogen compounds, and other light atomic mass particles.

3. The process of claim 1 wherein said particles are selected from the group consisting of neutral molecules, charged molecules, atoms, and electrons.

4. The process of claim 1 wherein said particles are energetic.

5. The process of claim 4 wherein said energetic particles have sufficient kinetic energy to penetrate through said surface to said selected depth underneath said surface.

6. The process of claim 1 wherein said step of providing energy sustains said controlled **cleaving** action to remove said material from said substrate to provide a film of material.

7. The process of claim 1 wherein said step of providing energy increases a controlled stress in said material and sustains said controlled **cleaving** action to remove said material from said substrate to provide a film of material.

8. The process of claim 1 further comprising a step of providing additional energy to said substrate to sustain said controlled **cleaving** action to remove said material from said substrate to provide a film of material.

9. The process of claim 1 further comprising a step of providing additional energy to said substrate to increase a controlled stress in said material and to sustain said controlled **cleaving** action to remove said material from said substrate to provide a film of material.

10. The process of claim 1 wherein said introducing step forms damage selected from the group consisting of atomic bond damage, bond substitution, weakening, and breaking bonds of said substrate at said selected depth.

11. The process of claim 10 wherein said damage causes stress to said substrate material at said selected depth.

12. The process of claim 10 wherein said damage reduces an ability of said substrate material to withstand stress without a possibility of a **cleaving** of said substrate material.

13. The process of claim 1 wherein said propagating cleave front is selected from a single cleave front or multiple cleave fronts.

14. The process of claim 1 wherein said introducing step causes stress of said material region at said selected depth by a presence of said particles at said selected depth.

15. The process of claim 1 wherein said devices comprise capacitors.

16. The process of claim 1 wherein said devices comprise resistors.

17. The process of claim 1 wherein said devices comprise transistors.

18. The process of claim 1 wherein said energy is provided by a source selected from the group consisting of a thermal source, a thermal sink, a mechanical source, a chemical source, and an electrical source.

19. The process of claim 1 wherein said step of introducing is a step(s) of beam line ion implantation.

20. The process of claim 1 wherein said step of introducing is a step(s) of plasma immersion ion implantation.

21. The process of claim 1 further comprising a step of joining said surface of said substrate to a surface of a target substrate to form a stacked assembly before said providing step.

22. A process for forming a memory integrated circuit, said process comprising steps of:

providing a substrate, said substrate comprising a plurality of capacitors defined thereon, said substrate also comprising a dielectric layer formed overlying said capacitors and a surface that is substantially planar overlying said dielectric layer;

introducing particles in a selected manner through said surface of said substrate to a selected depth underneath said surface and said capacitors, said particles being at a concentration at said selected depth to define a substrate material to be removed above said selected depth;

joining said surface of said substrate to a face of a target substrate; and

providing energy to a selected region of said substrate to initiate a controlled **cleaving** action at said selected depth in said substrate, whereupon

said **cleaving** action is made using a propagating cleave front to free a portion of said material to be removed from said substrate.